

Adolescents' Self-Reported Sleep Quantity and Sleep-Related Personality Traits – A Pilot Study

Selbsteinschätzung der Schlafquantität und der schlafbezogenen Persönlichkeitsmerkmale von Adoleszenten – Eine Pilotstudie

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Summary

Question of the study The aim of this pilot study was to assess adolescents' self-reported sleep quantity and personality traits in order to describe typical personality patterns related to sleep and characteristics that distinguish between good and poor sleepers.

Participants and methods A total of 134 adolescents (mean age: 18.60; 74 females and 60 males) completed a single sleep-related personality traits questionnaire (FEPS-I) and daily sleep logs for seven consecutive days. The daily logs data were used to cluster participants in three subgroups of poor, normal, and good sleep quality.

Results Up to 25 % of the adolescents could be considered 'poor' sleepers and displayed personality traits such as decreased self-confidence, increased mental arousal, and self-perception of body sensations. Female adolescents were at high risk of being 'poor' sleepers, yet up to 20 % of the adolescents could be described as 'good' sleepers. Fifty-five per cent of the adolescents could be considered 'normal' sleepers without appropriate sleep-related personality traits or sleeping habits.

Conclusions The pilot project, using exclusively self-reported sleep data, showed that about a quarter of adolescents were considered 'poor' sleepers with specific sleep-related personality traits. Further investigations are needed to support these results and to allow possible preventive interventions.

Keywords sleep-related personality traits – adolescents – sleep quality – pilot study

Zusammenfassung

Fragestellung Diese Pilotstudie hatte zum Ziel, die Schlafquantität sowie schlafbezogene Persönlichkeitsmerkmale von Adoleszenten mittels Selbsteinschätzung zu erfassen, um spezifische Persönlichkeitsmuster zu beschreiben und gute von schlechten Schläfern zu unterscheiden.

Teilnehmer und Methodik 134 Adoleszente (Alter: 18,60; 74 weibliche und 60 männliche Teilnehmer) füllten einen Fragebogen zu schlafbezogenen Persönlichkeitsmerkmalen, sowie eine Woche lang ein Schlafprotokoll aus. Aus den Daten des Protokolls wurden mittels Clusteranalyse drei Untergruppen mit guter, normaler und schlechter Schlafqualität definiert.

Ergebnisse Rund 25 % der Adoleszenten konnten als schlechte Schläfer bezeichnet werden, welche ein verringertes Selbstvertrauen, sowie erhöhte psychische Erregung und Körperbeachtung aufwiesen. Das Risiko, zur Gruppe der 'schlechten' Schläfer zu gehören, war für weibliche Adoleszente erhöht. Rund 20 % der Adoleszenten waren 'gute' Schläfer. 55 % der Adoleszenten waren 'normale' Schläfer mit entsprechenden Persönlichkeitsmerkmalen und Schlafgewohnheiten.

Schlussfolgerungen Das ausschließlich auf Selbsteinschätzungen basierende Pilotprojekt zeigte, dass rund 25 % der Adoleszenten 'schlechte' Schläfer waren und spezifische

Persönlichkeitsmerkmale aufwiesen. Breiter angelegte Untersuchungen sind notwendig, um die gefundenen Resultate zu erhärten und um präventive Maßnahmen zu formulieren.

Schlüsselwörter schlafbezogene Persönlichkeitsmerkmale – Adoleszente – Schlafqualität – Pilotstudie

Introduction

Sleep quantity decreases from childhood to adolescence [6, 17], declining from about 10 h at 10 years of age to between 6.5 and 7.5 h in older adolescents, with a marked increase of sleep time on weekends compared with school nights [19]. Adolescents whose sleep time is reduced by a degree considered as detrimental normally display greater difficulties in achieving high performance at school [24, 27], at work, or while driving.

Sleep problems are often reported during adolescence [17, 21, 25], with the proportion ranging from 10 % up to 56 % of the population (for review, see [24] and [25]). Possible sleep problems of adolescents are mediated by four intertwined factors: physiological changes [17] such as delayed-sleep phase preference [7], psychological strain such as coping with new social settings and vocational decisions [9], and conflicting family dysfunctions [25]. Furthermore, an increase of psychiatric morbidities such as anxiety, depression, and aberrant conduct normally leads to sleep deterioration [20], and sleep may also be affected by specific lifestyles. Indeed, decreased parental control, peer pressure, or peer activities such as attending public events (sports events, music concerts, discos, etc.) normally lead to sleep irregularities. Irrespective of possible reasons, sleep problems have far-reaching effects on many adolescents [5, 12]. Normally, poor sleep is perceived as a higher propensity to sleepiness linked to an increased difficulty in concentrating on given tasks, which, in turn, leads to reduced performance [17, 19, 23, 25].

In addition, a higher prevalence of sleep problems in female adolescents has been repeatedly demonstrated [21, 25]. These findings have led to controversial explanations, ranging from physiological change to the suggestion that female adolescents may be more aware of and more affected by family life disruptions than males [25]. Although the last statement has not been confirmed, a good home atmosphere was the most important contributing factor to good perceived sleep quality among boys [24].

Although efforts have been made to assess possible causes and symptoms of adolescents' problems, so far no data have been collected with respect to possible personality traits related to sleep. Recent findings [13] demonstrated that subjects complaining of sleep disturbances showed specific personality traits, such as increased mental arousal, aggressive behaviour, low self-confidence, or dissatisfied attitude towards life. The aim of this study was to assess adolescents' self-reported personality traits related to sleep and to describe possible personality patterns linked to sleep quantity, so as to distinguish between good and poor sleepers with high or low sleep quality.

Therefore, the following questions were addressed:

- Did clusters of specific subgroups of individuals showing personality characteristics emerge from the response data of daily sleep logs?
- To what extent did clustered subgroups show characteristic sleep-related personality traits?
- How many hours did adolescents sleep, on average, at night?
- Did sleeping time vary during the investigation period?
- Did specific gender characteristics emerge from the data?

Methods

Population

A total of 134 adolescents (age: 18.60 ± 1.37), 74 females (18.65 ± 1.23) and 60 males (18.55 ± 1.53) took part in the study. They were attending the seventh grade at a high school in Basel, Switzerland; they needed another year to obtain their high school diploma. Participants were informed about the purpose of the study and the confidential nature of data treatment. The investigation was approved by the dean of the high school. Data were collected during school term; students went to school from Monday to Saturday.

Assessment of sleep quantity and sleep-related personality traits

Participants had to complete a single sleep-related personality questionnaire, i.e. a specific questionnaire for assessing personality traits of patients with sleep complaints (FEPS-I [13]) and daily sleep log questionnaires for seven consecutive days [2], starting on a working day.

The FEPS-I questionnaire consists of 64 items, describing six sleep personality traits and subjective sleep quality on a 5-point scale ranging from 'is not at all true' to 'is completely true'. The following dimensions are addressed: attitude to life (satisfied, confident, trustful versus depressive, dissatisfied, resigned, lacking emotion); self-confidence (self-confident, resolute, carefree versus anxious, unsure, indecisive, easily irritated); mental arousal (relaxed, balanced, calm versus tense, irritable, exhausted, burdened); physical arousal (relaxed, balanced, without any complaints versus nervous, over-agitated, complaining); aggressive behaviour (externalizing, competitive, sustaining one's own opinion versus internalizing, over-controlling, inhibited, evasive)¹; self-perception of body sensations (easy-going, carefree, confident versus hypochondriac, complaining), and subjective sleep quality (regenerative, undisturbed, unimpaired versus impaired, disturbed, not regenerative). The sleep-related personality questionnaire was chosen because it has been shown to be suitable both for patients suffering from sleep disorders and for healthy subjects.

The daily sleep log questionnaire was taken from a conventional and widely used manual for psychological treatment of sleep complaints [2]. Participants were asked to fill it out twice a day for a week, in the evening and in the morning. In the evening, participants completed questions about daytime sleepiness, physical relaxation, concentration, and mood on an 8-point visual analogue scale. In the morning, the questionnaire asked about sleep quality, tiredness at bed time, and feeling of relaxation, using the same analogue scale. In addition, sleep onset latency and the bed and wake-up times had to be listed (see table 1).

¹The expression of aggressive behaviour, proposed by the test authors, may be misleading; perhaps the dimension should be translated as 'assertive behaviour'.

Statistical analysis

To formulate subgroups of sleepers with good or poor sleep quality, the following three variables were chosen to describe night sleep and daytime performance: sleep quality, concentration, and daytime sleepiness (cf. [23–25]). Cluster analyses were performed, using the method of the linkage between groups and the Euclidean distance as measures [1, 4, 11].

Differences between subgroups with respect to personality traits and daily log ratings were calculated with the Kruskal–Wallis *H*-test for non-parametric data distribution. Post-hoc tests were performed using the Mann–Whitney *U*-test with a Bonferroni–Holm correction for *P* values.

Odds ratio calculations (OR) were applied to estimate specific risks (e.g. gender and subgroups of sleepers).

The distribution of gender and bed time categories with respect to subgroups were calculated with Pearson's chi-square tests, whereas gender differences for the sleep variables were determined by the Mann–Whitney *U*-test.

Means of sleep time were compared to reference values using one-sample *t*-tests.

To detect subgroup-dependent differences in sleep time, an ANOVA for repeated measure was performed with the seven night measurements as within-factor and the three subgroups as between-factor. In case of violations of homogeneity, the Greenhouse–Geisser method for corrections of degrees of freedom was applied, reporting the original degrees of

freedom with the relevant Greenhouse–Geisser epsilon value (ϵ). To calculate subgroup-dependent differences between the weekend night and the mean of the week nights, an ANOVA for repeated measures was performed with post-hoc tests using a Bonferroni–Holm correction for *P* values.

Test results with an alpha level of below 0.05 are reported as significant, while those between 0.05 and 0.1 are shown as a trend. The statistics were processed using SPSS 12.0 for Windows.

Results

Subgroups

Cluster analysis showed differentiation of three subgroups. Significant group differences were found for daytime sleepiness (*H*-test: $\chi^2(2) = 31.81$, $P < 0.001$), for concentration (*H*-test: $\chi^2(2) = 48.34$, $P < 0.001$), and for sleep quality (*H*-test: $\chi^2(2) = 51.96$, $P < 0.001$). Detailed post-hoc analyses revealed that the subgroups diverged widely and showed consistent profiles. Thus, according to *Sadeh et al.* [22] and *Hoffmann et al.* [13], the group with very low values was labelled as 'poor' sleepers, while the cluster displaying very high results was labelled 'good' sleepers. The group between these extremes was designated 'normal' sleepers (see table 1 for descriptive and inferential statistical data).

Table 1. Descriptive and statistical overview of personality related to sleep and sleep log questionnaire data.

	Subgroups			Statistical analyses			
	‘Poor’ sleepers (<i>n</i> = 34) 25.4 %	‘Normal’ sleepers (<i>n</i> = 73) 54.47 %	‘Good’ sleepers (<i>n</i> = 27) 20.15 %	Kruskal-Wallis <i>H</i> -test [χ^2 (d.f.)]	Mann-Whitney <i>U</i> -Test		
					ps vs ns <i>Z</i>	ps vs gs <i>Z</i>	ns vs gs <i>Z</i>
Daily sleep logs: evening rating ^a							
daytime sleepiness ^b	4.85 (0.68)	3.78 (1.77)	3.17 (1.43)	(2) = 31.81***	−5.10***	−4.62**	−1.97
physical relaxation	4.44 (1.51)	3.43 (1.08)	2.90 (1.20)	(2) = 24.23***	−3.89**	−4.20***	−2.43*
concentration ^b	4.64 (0.62)	3.56 (0.90)	2.46 (1.00)	(2) = 48.34***	−5.43***	−6.19***	−3.27***
mood	3.79 (0.84)	2.97 (0.87)	2.67 (1.40)	(2) = 22.67***	−4.22***	−3.92**	−1.57
Daily sleep logs: morning rating ^a							
sleep quality ^b	3.38 (0.67)	2.27 (1.66)	2.88 (1.15)	(2) = 51.96***	−7.23***	−2.74**	−3.02**
tiredness at bedtime	5.73 (1.11)	5.65 (1.42)	4.19 (1.42)	(2) = 18.77***	−0.93	−4.19***	−3.82***
feeling of relaxation	5.09 (1.83)	3.97 (1.50)	3.24 (1.58)	(2) = 32.49***	−4.93***	−4.76***	−1.98*
sleep onset latency (min)	20.08 (18.05)	10.29 (7.34)	20.00 (12.51)	(2) = 16.97***	−1.89 ^(*)	−0.87	−4.36***
sleep period time (min)	451.45 (51.09)	422.87 (47.89)	464.89 (55.88)	(2) = 24.99***	−3.29 ^(*)	−1.90 ^(*)	−4.45***
					chi-square χ^2 (d.f.)		
					ps vs ns	ps vs gs	ns vs gs
Gender: female/male	24/10	41/32	9/18	(2) = 8.50*	(1) = 2.02	(1) = 8.41***	(1) = 4.11*
Bedtime normally between							
8 to 10 PM	3	0	7	(6) = 36.39***	(3) = 5.05	(3) = 34.32**	(3) = 17.78**
10 to 11 PM	6	17	16				
11 PM to midnight	18	42	5				
after midnight	8	12	0				

^aMean of seven consecutive days and nights; low score means: the dimension is more pronounced; e.g. subjects with 3.17 points have less daytime sleepiness than those with 4.85 points.

^bSince these three variables were used for cluster analysis, significant group differences were evident.

ps = 'poor' sleepers, ns = 'normal' sleepers, gs = 'good' sleepers.

(*) $P < 0.1$, * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

Daily sleep logs

Significant group differences were observed for mood (H -test: $\chi^2(2) = 22.67$, $P < 0.001$), for physical relaxation (H -test: $\chi^2(2) = 24.23$, $P < 0.001$), for tiredness at bedtime (H -test: $\chi^2(2) = 18.77$, $P < 0.001$), and for degree of relaxation (H -test: $\chi^2(2) = 32.49$, $P < 0.001$). In the same vein, highly significant group differences were found for sleep period time (H -test: $\chi^2(2) = 24.99$, $P < 0.001$) as well as for bed time ($\chi^2(2) = 36.39$, $P < 0.001$). Detailed post-hoc comparisons showed that generally 'poor' sleepers ($n = 34$; 25.15 %) displayed the lowest values (with the exception of sleep period time). In contrast, 'good' sleepers ($n = 27$; 20.15 %) showed high values; in particular, they had the longest sleep period time, but their sleep onset latency was not shortened. Furthermore, none of the sleepers with good sleep quality went to bed after midnight (see table 1 for statistical details).

Personality traits related to sleep

Concerning the data compiled from the sleep-related personality questionnaire (FEPS-I), significant subgroup differences were found for the dimension self-confidence (H -test: $\chi^2(2) = 18.77$, $P < 0.05$), mental arousal (H -test: $\chi^2(2) = 10.68$, $P < 0.01$), aggressive behaviour (H -test: $\chi^2(2) = 14.87$, $P < 0.01$), body self-perception (H -test: $\chi^2(2) = 8.84$, $P < 0.05$) and subjective sleep quality (H -test: $\chi^2(2) = 7.30$, $P < 0.05$). Detailed post-hoc comparisons showed that, again, 'poor' sleepers displayed a consistent profile accounting for personality traits, or in other words, subjects with poor sleep quality showed decreased values for self-confidence, aggressive behaviour, and body self-perception, but increased values for mental arousal (see table 2 for statistical details).

Total sleep time compared to documented norms

Other studies [4, 5, 10] have found an average sleep time of approximately 6.5 to 7.5 h (i.e. 390 to 450 min) in

adolescence. With respect to this finding, the whole sample (see table 1) showed a significantly larger number of sleeping hours ($t(133) = 13.23$, $P < 0.001$), and single subgroups also had significantly increased mean differences ('poor' sleepers: $t(33) = 9.76$, $P < 0.001$; 'normal' sleepers: $t(72) = 7.14$, $P < 0.001$; 'good' sleepers: $t(26) = 10.89$, $P < 0.001$).

Total sleep time during the study period

The ANOVA for repeated measures was significant for the factor *nights over time* ($F(6, 750) = 2.94$, $P < 0.05$, $\varepsilon = 0.76$) as well as for the factor *subgroup* ($F(2, 125) = 14.97$, $P < 0.001$) and for the interaction *subgroup* \times *nights over time* ($F(12, 750) = 3.85$, $P < 0.001$, $\varepsilon = 0.76$). Hence, within all three subgroups, sleeping time changed significantly over the seven nights; the sleeping hours accordingly differed significantly between the subgroups (see figure 1).

Since students had six-day school weeks, only night 6, i.e. the night from Saturday to Sunday, could be considered a weekend night. The question was whether total sleep time of this night changed significantly with respect to the mean of

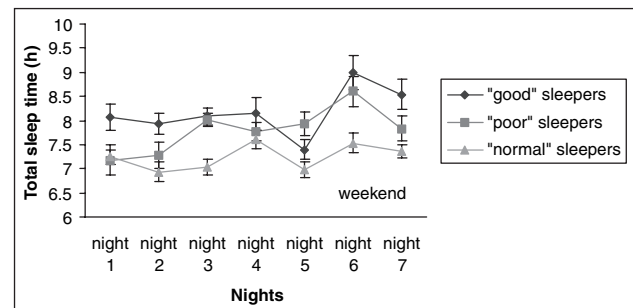


Figure 1. Hours of sleep (mean \pm SEM) over seven nights within the three subgroups of 'poor', 'normal', and 'good' sleepers.

Table 2. Descriptive and statistical overview of personality values related to sleep (FEPS-I).

FEPS variables	Subgroups			Kruskal-Wallis <i>H</i> -test $[\chi^2(d.f.)]$	Mann-Whitney <i>U</i> -Test		
	'Poor' sleepers ($n = 34$) 25.4 %	'Normal' sleepers ($n = 73$) 54.47 %	'Good' sleepers ($n = 27$) 20.15 %		ps vs ns <i>Z</i>	ps vs gs <i>Z</i>	ns vs gs <i>Z</i>
Attitude towards life ^a	4.63 (0.91)	4.54 (1.31)	3.98 (1.14)	(2) = 4.24	-1.30	-1.50	-1.02
Self-confidence ^b	3.09 (1.43)	2.72 (0.72)	2.29 (0.61)	(2) = 6.76*	-0.57	-2.09*	-2.46*
Mental arousal ^c	3.11 (1.01)	2.62 (0.60)	2.14 (1.03)	(2) = 10.68**	-2.26*	-2.79**	-2.01*
Physical arousal ^d	2.33 (1.03)	2.04 (0.56)	1.86 (0.41)	(2) = 3.14	-1.05	-1.66(*)	-1.17
Aggressive behaviour ^e	2.53 (0.51)	2.55 (0.51)	2.22 (0.84)	(2) = 14.87**	-0.50	-0.12	-0.20
Body self-perception ^f	2.70 (0.88)	2.69 (0.43)	2.33 (0.64)	(2) = 8.84*	-2.05*	-1.16	-2.58**
Subjective sleep quality ^g	2.48 (0.29)	2.53 (0.40)	2.07 (1.09)	(2) = 7.30*	-2.75*	-1.08	-0.59

FEPS-I = Fragebogen zur Erfassung allgemeiner Persönlichkeitsmerkmale Schlafgestörter (sleep personality questionnaire) [11]; low score means: the dimension is more pronounced towards the first pole; e.g. subjects with 2.07 points have a higher sleep quality than those with 2.48 points.

ps = 'poor' sleepers, ns = 'normal' sleepers, gs = 'good' sleepers.

^aSatisfied, confident, trustful versus depressive, dissatisfied, resigned, lack of emotion.

^bSelf-confident, resolute, carefree versus anxious, unsure, indecisive, easily irritated.

^cRelaxed, balanced, calm versus tense, irritable, exhausted, burdened.

^dRelaxed, balanced, without any complaints versus nervous, over-agitated, with complaints.

^eExternalizing, competitive, sustaining one's own opinion versus internalizing, over-controlling, inhibited, evasive.

^fEasy going, careless, confiding versus hypochondriac, complaining.

^gRegenerative, undisturbed, unimpaired versus impaired, disturbed, not regenerative.

(*) $P < 0.1$, * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

the other six nights (factor *night*) within and between groups (factor *group*). Significant mean differences were observed for the factor *night* ($F(1, 131) = 18.70, P < 0.001$) as well as for the factor *subgroup* ($F(2, 131) = 15.53, P < 0.001$); the interaction was not significant ($F(1, 131) = 1.90, NS$). Post-hoc tests revealed significant mean differences between 'poor' and 'good' sleepers. Hence, irrespective of the subgroup, compared with week nights, subjects slept significantly longer from Saturday to Sunday.

The same pattern of results was observed if the nights from Saturday to Sunday and from Sunday to Monday were considered weekend nights and afterwards compared with the mean of the five week nights.

Gender differences

Gender distribution between the three subgroups was significant ($\chi^2(2) = 8.50, P < 0.05$), showing an increased number of female adolescents to be 'poor' sleepers and a higher number of male adolescents to be sleepers with good sleep quality. Comparing gender differences with respect only to 'good' versus 'poor' sleeper groups ($\chi^2(1) = 8.41, P < 0.01$), the odds ratio showed that the risk for female participants being assigned to the 'poor' sleepers category was 4.8-fold higher (OR, $P < 0.05$) than for male adolescents.

When the personality variables were recalculated for gender, significant differences were found for mental ($Z = -2.03, P < 0.05$) and physical arousal ($Z = -2.98, P < 0.01$), aggressive behaviour ($Z = -2.85, P < 0.01$), and body self-perception ($Z = -2.28, P < 0.05$), thus revealing significantly increased, but for aggressive behaviour decreased, values for female adolescents.

Significant gender differences were observed in daily sleep log values for daily sleepiness ($Z = -2.91, P < 0.01$), mood ($Z = -4.88, P < 0.001$), and tiredness at bed time ($Z = -2.04, P < 0.05$); a trend to significance was found for concentration ($Z = -1.74, P < 0.1$), physical relaxation ($Z = -1.80, P < 0.1$), and feeling of relaxation ($Z = -1.70, P < 0.1$), indicating for female adolescents increased values for daily sleepiness and tiredness at bedtime, but decreased values for mood, concentration, and relaxation.

Discussion

Our pilot study demonstrated that specific subgroups of sleepers emerged, with subgroups showing different personality patterns derived from self-reported daily sleep logs and a sleep-related personality questionnaire.

On the basis of values from the sleep log of daytime sleepiness, concentration, and estimated sleep quality, three subgroups of 'poor', 'normal', and 'good' sleepers could be distinguished. These groups showed clearly distinguishable personality traits. 'Poor' sleepers (approximately 25 %) were characterised by low degrees of self-confidence as well as an increased mental arousal and self-perception of bodily sensations. On average, subjects in this group went to bed later, in a similar way to a group described in a previous publication that had a comparable group of 'poor' sleepers [19], and displayed more irregular patterns of sleeping quality over seven study nights. This issue is of special interest since epidemiological data show that chronic sleep disorders are associated with an increased risk of psychiatric disorders [26]. Furthermore, the percentage (25 %) of 'poor' sleepers among adolescents was similar to that reported by previous investigations, ranging from 10 % up to 56 % (for review see [24, 25]). Up to 20 % of the adolescents could be

described as 'good' sleepers, showing no unfavourable sleep personality traits. More than half of young people (55 %) could be considered 'normal' sleepers without unusual sleep-related personality traits or sleeping habits. Accordingly, one main result of the investigation is that the sleep personality questionnaire may form an easy and economical way for pre-screening subjects with low sleep quality, since it can be completed in about 10 minutes.

According to Hoffmann et al. [13], the questionnaire for assessing sleep-related personality traits does not allow the question of whether personality items cause poor sleep quality or vice versa to be answered; nor does the scientific community offer conclusive answers. Nevertheless, multi-causal factors, such as unfavourable environment, physical disorders, substance abuse, poor sleep hygiene, problems of circadian rhythmicity, and above all psychological strain normally precede sleep disorders (cf. [2, 3]). To this extent, there is reason to claim that personality traits such as negative attitude towards life, low self-confidence, or mental arousal may favour the development of sleep complaints and not vice versa.

In contrast to other observations [6], our adolescents slept approximately seven and a half hours a night with a peak for 'good' sleepers and a minimum for 'normal' sleepers. Irrespective of the groups, the total number of sleeping hours differed statistically from other investigations [5, 6]. However, since 'normal' sleepers had a minimum of sleep time, our data suggest that the total sleep time is not an adequate marker for judging sleep quality.

Similar to previous investigations [19] and irrespective of the subgroup, students had a marked increase of sleep time from Saturday to Sunday as compared with school nights.

Female adolescents were at risk of being classified within the group of 'poor' sleepers, a finding reported by others [8, 15, 21, 25] (the exception being Cortesi et al. [10]). On the basis of the data from the sleep personality questionnaire, we may speculate that female adolescents had more difficulties with assertiveness, which in turn was associated with increased mental and physical arousal and body self-perception issues. Since the female population remains at risk for suffering sleeping complaints in early, middle [18], as well as late adulthood [14], it may be advisable to familiarize female adolescents with issues relating to sleep hygiene, as successfully pursued by Cortesi et al. [10].

The pilot study has limitations in view of its sample size. Furthermore, since participants were exclusively recruited from a high school, the sample is a long way from reflecting a completely reliable cross-section of adolescents with respect to vocational career, socio-economic status, and ethnic origins (cf. [16]). In a similar vein, no thorough data were collected concerning daily activities, such as sports or cycling, as well as potential sources of stress such as daily family, school, or peer issues. In addition, since questions related to drug usage (caffeine, THC, alcohol, Ecstasy, nicotine, etc.) were only partially answered, statistical analyses were not possible in this respect. Therefore, indications of potential mechanisms contributing to the high incidence (up to 25 %) of adolescents complaining about poor sleep remain unexplained. Research highlighting more complete assessment of psychological, physical, and social processes underlying sleep complaints in adolescents is lacking to date, leaving us with a puzzle of mixed and hidden factors [5]. A further weak point is the lack of objective records of physiological states of sleep (e.g. actimetry or sleep EEG).

Conclusion

As a pilot study, the investigation achieved its aim of gathering initial significant and explorative information on self-reported personality traits related to sleep and sleep quantity values. The data allowed participants to be pooled into specific subgroups displaying consistent sleep-related personality traits and sleep patterns. Findings generally confirmed previously reported data. The next step should be an investigation covering a much broader sample, irrespective of vocational and ethnic considerations, as this would allow more general conclusions to be made and would provide more detailed information with a view to formulating potential preventive interventions.

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